

TRIODE-OUTPUT PENTODE

The triode section is intended for use as frame oscillator and A.F. amplifier. The pentode section is intended for use as frame output tube and A.F. power amplifier.

QUICK REFERENCE DATA

<u>Triode section</u>		
Anode current	I_a	3.5 mA
Transconductance	S	2.2 mA/V
Amplification factor	μ	70 -
<u>Pentode section</u>		
Anode peak voltage	V_{ap}	max. 2.5 kV
Anode current	I_a	41 mA
Transconductance	S	7.5 mA/V
Amplification factor	$\mu_{g_2g_1}$	9.5 -
Output power	W_o	3.3 W

HEATING: Indirect by A.C. or D.C.; series supply

Heater current

I_f 300 mA

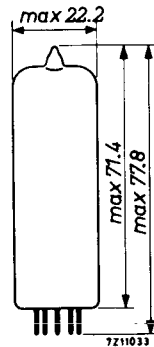
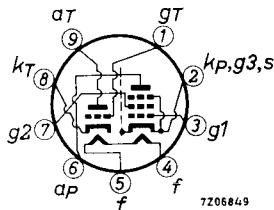
Heater voltage

V_f 16 V

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval



CAPACITANCES

Triode section

Anode to all except grid	$C_{a(g)}$	4.3	pF
Grid to all except anode	$C_{g(a)}$	2.7	pF
Anode to grid	C_{ag}	4.4	pF
Grid to heater	C_{gf}	max. 0.02	pF

Pentode section

Anode to all except grid No.1	$C_{a(g_1)}$	8.0	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	9.3	pF
Anode to grid No.1	C_{ag_1}	max. 0.3	pF
Grid No.1 to heater	C_{g_1f}	max. 0.3	pF

Between triode and pentode sections

Anode triode to grid No.1 pentode	C_{aTg_1P}	max. 0.02	pF
Grid triode to anode pentode	C_{gTaP}	max. 0.02	pF
Grid triode to grid No.1 pentode	C_{gTg_1P}	max. 0.025	pF
Anode triode to anode pentode	C_{aTaP}	max. 0.25	pF

TYPICAL CHARACTERISTICS

Triode section

Anode voltage	V_a	100	V
Grid voltage	V_g	0	V
Anode current	I_a	3.5	mA
Transconductance	S	2.2	mA/V
Amplification factor	μ	70	-

Pentode section

Anode voltage	V_a	170	V
Grid No.2 voltage	V_{g_2}	170	V
Grid No.1 voltage	V_{g_1}	-11.5	V
Anode current	I_a	41	mA
Grid No.2 current	I_{g_2}	9	mA
Transconductance	S	7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	9.5	-
Internal resistance	R_i	16	k Ω

OPERATING CHARACTERISTICS

Triode section as A.F. amplifier

A. Signal source resistance	R_s	0.22		$M\Omega$		
Grid resistor	R_g	3		$M\Omega$		
Grid resistor of next stage	$R_{g'}$	0.68		$M\Omega$		
Supply voltage	V_b	200	170	V		
Cathode resistor	R_k	2.2	2.7	$k\Omega$		
Anode resistor	R_a	220	220	$k\Omega$		
Anode current	I_a	0.52	0.43	mA		
Voltage gain	V_o/V_i ¹⁾	52	51	-		
Max. output voltage	V_o max	26	25	V_{RMS}		
Distortion	d_{tot} ²⁾	1.6	2.3	%		
B. Signal source resistance	R_s	0.22		$M\Omega$		
Grid resistor	R_g	22		$M\Omega$		
Grid resistor of next stage	$R_{g'}$	0.68		$M\Omega$		
Supply voltage	V_b	200	200	170	170	V
Cathode resistor	R_k	0	0	0	0	Ω
Anode resistor	R_a	100	220	100	220	$k\Omega$
Anode current	I_a	1.05	0.61	0.86	0.50	mA
Voltage gain	V_o/V_i ¹⁾	50	55	49	53	-
Max. output voltage	V_o max	24	25	19	20	V_{RMS}
Distortion	d_{tot} ³⁾	1.5	1.4	1.4	1.4	%

MICROPHONY AND HUM

The triode section can be used without special precautions against microphony and hum in circuits in which an input voltage $V_i \geq 10$ mV_{RMS} gives an output of 50 mW of the output stage. Z_g (50 Hz) = 0.25 M Ω . The A.C. voltage between pin 4 and cathode should not exceed 6.3 V. If the tube is used in television circuits where the frequency of the heater supply is not synchronized with the frame frequency, this may cause interference due to hum. At page 8 the relation is shown between the permissible value of Z_{g1} of the pentode section and the A.C. voltage between pin 4 and the cathode. This curve applies to C_{g1f} is 0.8 pF (inclusive of wiring and tube socket).

¹⁾ Measured at small input voltage

²⁾ At lower output voltages the distortion is proportionally lower.

³⁾ At lower output voltages down to 5 V_{RMS} the distortion remains approximately constant. At values below 5 V_{RMS} the distortion is approximately proportional to V_o .

OPERATING CHARACTERISTICS

Pentode section

A.F. power amplifier, class A (measured with V_k constant)

Supply voltage $V_{ba}=V_{bg_2}$		170	200	230	V						
Grid No.2 series resistor (non-decoupled)	R_{g_2}	0	470	1200	Ω						
Cathode resistor	R_k	200	330	490	Ω						
Load resistance	$R_{a\sim}$	3.25	4.5	6	k Ω						
Grid No.1 driving voltage	V_i	0 0.61 5.9		0 0.66 6.7		0 0.75 7.8		V_{RMS}			
Anode current	I_a	42	-	44	35	-	37	30	-	31	mA
Grid No.2 current	I_{g_2}	9.2	-	15.5	7.8	-	13.3	6.6	-	11.0	mA
Output power	W_o	0	0.05	3.2	0	0.05	3.3	0	0.05	3.25	W
Distortion	d_{tot}	-	-	10	-	-	10	-	-	10	%

A.F. power amplifier, class AB, two tubes in push-pull

Anode supply voltage	V_{ba}	200	230	V		
Grid No.2 supply voltage	V_{bg_2}	200	200	V		
Common cathode resistor	R_k	170	200	Ω		
Load resistance	$R_{aa\sim}$	4.5	7	k Ω		
Grid No.1 driving voltage	V_i	0	14.2	0	13.0	V_{RMS}
Anode current	I_a	2x35	2x42.5	2x30	2x34.5	mA
Grid No.2 current	I_{g_2}	2x8	2x16.5	2x6.2	2x13.5	mA
Output power	W_o	0	9.3	0	10	W
Distortion	d_{tot}	-	6.3	-	5.5	%

Frame output application

The circuit should operate satisfactorily with peak anode current $I_{aP} = 85$ mA at $V_a = 50$ V, $V_{g_2} = 170$ V, $I_f = 300$ mA. The minimum available I_{aP} value at end of life is

70 mA at $V_a = 50$ V, $V_{g_2} = 170$ V, $I_f = 280$ mA

80 mA at $V_a = 50$ V, $V_{g_2} = 190$ V, $I_f = 280$ mA

LIMITING VALUES (Design centre rating system)

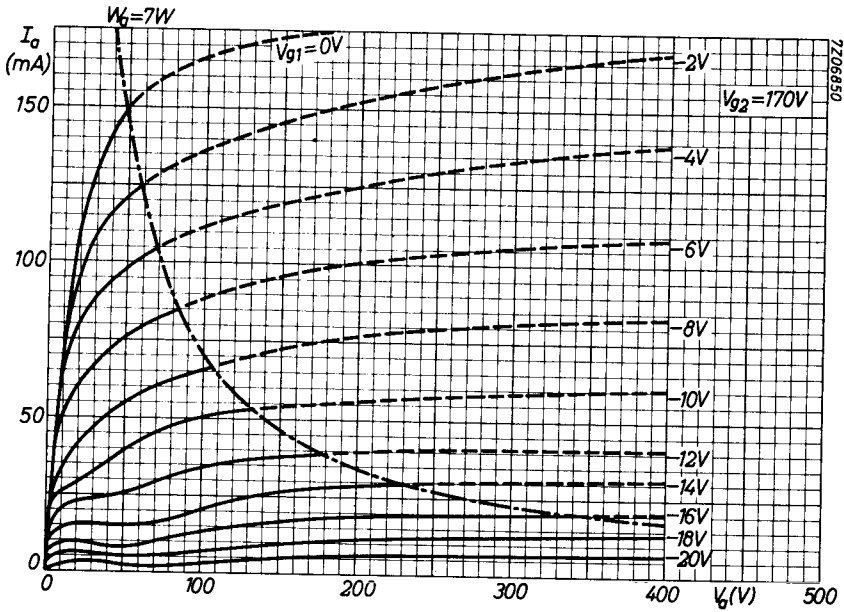
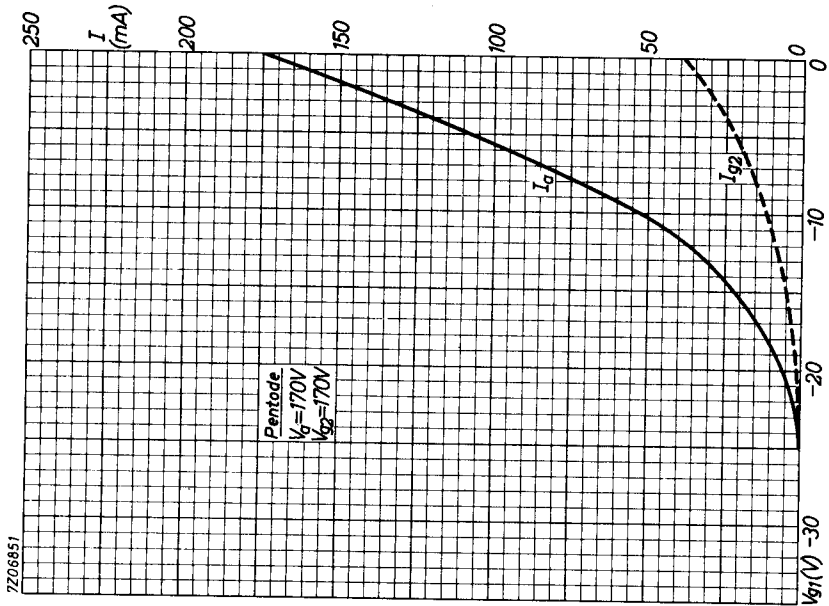
Triode section

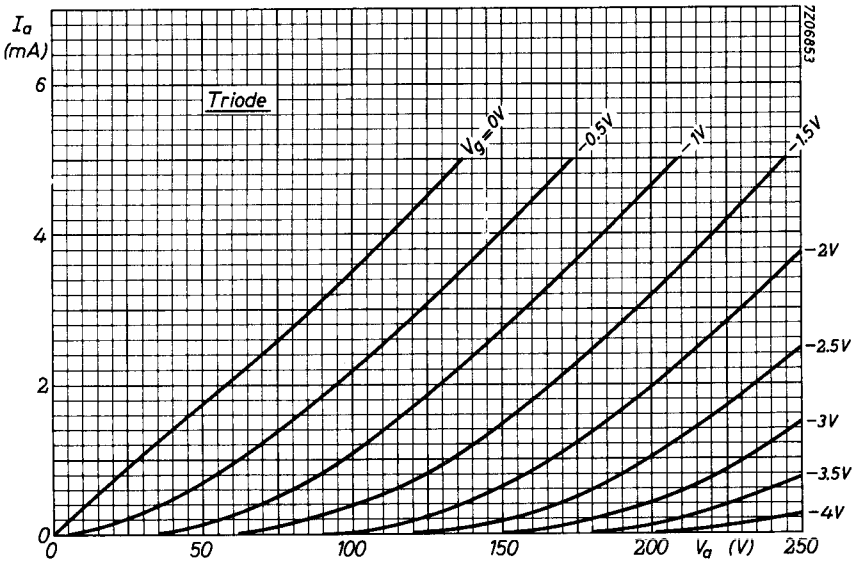
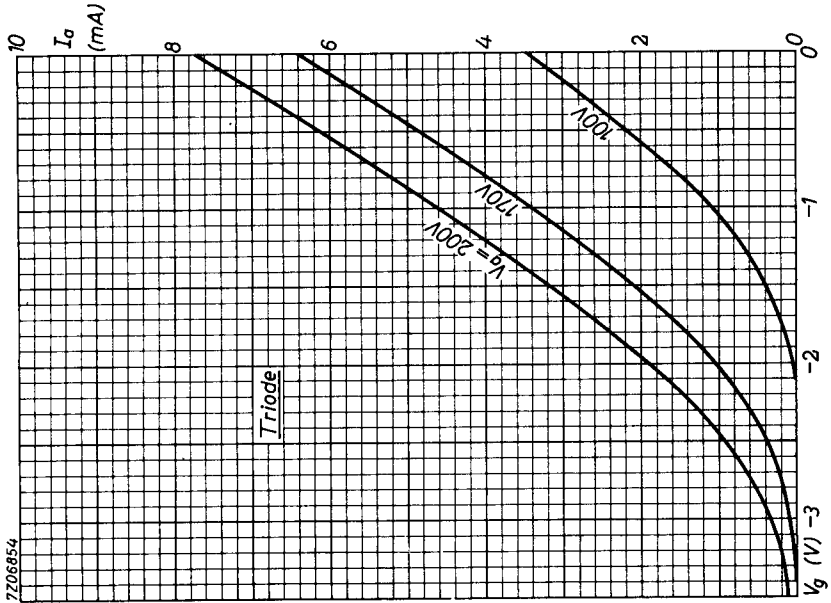
Anode voltage	V_{a0}	max. 550 V
	V_a	max. 250 V
Anode peak voltage	V_{ap}	max. 600 V ¹⁾
Anode dissipation	W_a	max. 1 W
Cathode current, average	I_k	max. 15 mA
peak	I_{kp}	max. 100 mA ¹⁾
Grid resistor, for fixed bias	R_g	max. 1 M Ω
for automatic bias	R_g	max. 3 M Ω
Grid impedance at 50 Hz	Z_g	max. 0.5 M Ω
Cathode to heater voltage	V_{kf}	max. 200 V

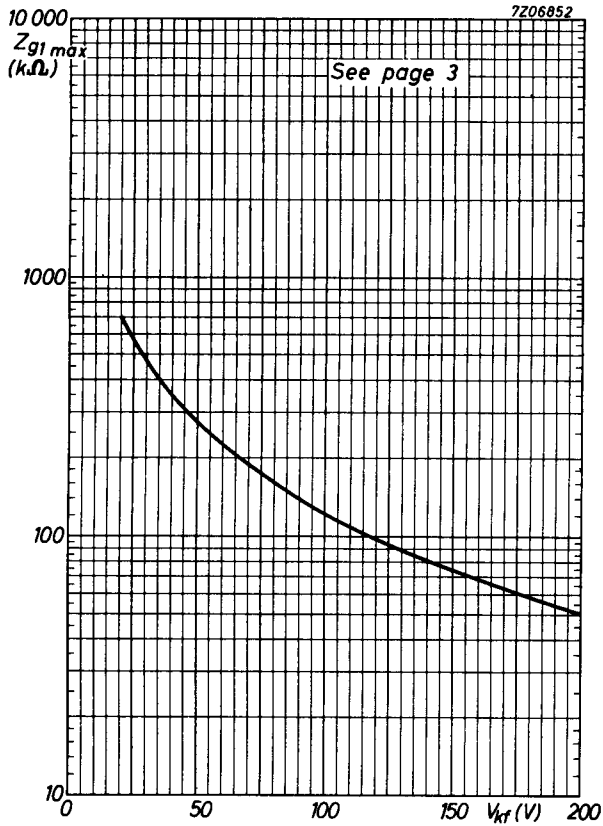
Pentode section

Anode voltage	V_{a0}	max. 550 V
	V_a	max. 250 V
Anode peak voltage, positive	V_{ap}	max. 2.5 kV
negative	$-V_{ap}$	max. 500 V
Grid No.2 voltage	V_{g20}	max. 550 V
	V_{g2}	max. 250 V
Anode dissipation		
for frame output application	W_a	max. 5 W
for A.F. output application	W_a	max. 7 W
Grid No.2 dissipation, average	W_{g2}	max. 1.8 W
average for frame output application (W_a max 4 W)	W_{g2}	max. 2 W
peak	W_{g2p}	max. 3.2 W
Cathode current	I_k	max. 50 mA
Grid No.1 resistor, for fixed bias	R_{g1}	max. 1 M Ω
for automatic bias	R_{g1}	max. 2 M Ω
Cathode to heater voltage	V_{kf}	max. 200 V

¹⁾ Max. pulse duration 4% of a cycle with a maximum of 0.8 msec.







PHILIPS

Data handbook



Electronic
components
and materials

PCL82

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9	FP	1999.08.02